

ENERGY EFFICIENCY SECTOR: THE “WHOLE-BUILDING” APPROACH

◆ UTAH

Energy Efficient Building Design

The new Utah Department of Natural Resources building was designed using a “whole-building” approach that ensures that the entire building works as a single system to reduce energy consumption. The building is oriented to minimize solar heat gain but maximize natural light. Special light shelves shade the building from glare and heat while simultaneously reflecting light into the building. Strategically placed windows with special glass admit sunlight while blocking harmful and heat producing rays. High efficiency ceiling and task lighting supplement natural lighting when and where necessary. LED signs, occupancy sensors, and dimmers further reduce energy consumption. Innovative, evaporative cooling technology reduces the need to use mechanical chillers. High efficiency motors and variable speed drives are used to operate the cooling and air exchange systems in an energy saving manner. Landscaping around the building was also designed to maximize energy efficiency. These and other resource conservation and energy efficiency measures make the design of the building a comprehensive approach to energy management. Such measures have quite an impact on the energy needs of the 105,000 square foot, \$11.9 million building.



Results:

The improved design of the Utah DNR building is estimated to reduce energy use by 42% over similarly sized buildings. In the past year an estimated 777,195 kWh of electricity were saved due to the design features of the building.* This energy savings is slightly offset by increased use of natural gas (1,470 therms), but an overall savings of 431 metric tons of CO₂ (117 MTCE**) per year is achieved. The reduction in energy use also reduces SO₂ emissions by 0.7 metric tons*** and NO_x emissions by 1.6 metric tons***. The reduced energy demand associated with the building is estimated to save the Utah DNR \$50,000 annually.

Greenhouse Gas Reductions	Cost Savings
117 MTCE**	\$50,000

Principal Actors:

The Utah Department of Natural Resources was the prime actor in deciding to design their new building using a “whole-building” approach to reduce energy consumption and emphasize resource conservation.

Additional Information:

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This case study is based on information provided by Dave Lochtefeld of the Office of Energy and Resource Planning, Utah Department of Natural Resources and from information contained in the draft report *Carbon Dioxide Reduction Strategies in Utah: An Economic and Policy Analysis* prepared by the Office of Energy and Resource Planning of the Utah Department of Natural Resources.

* Energy data are estimated because the building is metered with several other DNR buildings. However, the estimates are believed to be an accurate measure of the energy savings associated with the building based on past energy use by the DNR site and past average use by square footage.

** Original data have been converted from kWh to Metric Tons of Carbon Equivalent (MTCE) using the following emission factor: 1.244 lbs CO₂ / kWh (The Cadmus Group, Inc. *Regional Electricity Emissions Factors Final Report*, The Cadmus Group, Inc., 1998, Exhibit 6). Data were converted from therms (1 therm=0.1 mmBtu) to MTCE using a factor of 31.61 lbs carbon/mmBtu. One metric ton=2205 lbs.

*** SO₂ and NO_x savings were calculated using emission factors of 1.99 lbs SO₂/MWh and 4.57 lbs NO_x/MWh (*The Emissions & Generation Integrated Database(E-GRID)*, EPA/Acid Rain Program).